

Alma Mater Studiorum Università di Bologna
Archivio istituzionale della ricerca

In-the-field determination of free acidity in olive oil using a portable battery-operated sensor system

This is the final peer-reviewed author's accepted manuscript (postprint) of the following publication:

Published Version:

Marco Grossi, E.V. (2021). In-the-field determination of free acidity in olive oil using a portable battery-operated sensor system. American Oil Chemists Society.

Availability:

This version is available at: <https://hdl.handle.net/11585/836292> since: 2021-10-26

Published:

DOI: <http://doi.org/>

Terms of use:

Some rights reserved. The terms and conditions for the reuse of this version of the manuscript are specified in the publishing policy. For all terms of use and more information see the publisher's website.

This item was downloaded from IRIS Università di Bologna (<https://cris.unibo.it/>).
When citing, please refer to the published version.

(Article begins on next page)

In-the-field determination of free acidity in olive oil using a portable battery-operated sensor system

Marco Grossi^a, Enrico Valli^{b,c}, Alessandra Bendini^{b,c}, Tullia Gallina Toschi^{b,c}, Bruno Riccò^a

^a Department of Electrical Energy and Information Engineering “Guglielmo Marconi” (DEI), *Alma Mater Studiorum*, University of Bologna, Bologna, Italy

^b Department of Agricultural and Food Sciences (DISTAL), *Alma Mater Studiorum*, University of Bologna, Cesena, Italy

^c Interdepartmental Centre of Agri-food Industrial Research (CIRI Agroalimentare), *Alma Mater Studiorum*, University of Bologna, Cesena, Italy

Olive oil quality grade is assessed by legal conformity check of chemical and sensory parameters and free acidity is the first of them. The official method to determine free acidity is by means of a titration carried out in a proper laboratory by trained personnel.

An alternative technique that can provide fast and accurate determination of oil free acidity is the electrical conductance measurement of an emulsion between an hydro-alcoholic solution and the sample under test. This method has the advantage to be implementable in automatic form and to use non toxic reagents that can be easily disposed of.

A portable battery operated sensor system has been designed and built making possible the free acidity measurement in about 30 seconds. The proposed system has been in-house validated using 30 olive oil samples with a satisfactory performance in terms of LOD, LOQ, precision and accuracy. This tool can be used on-site in production environment (e.g. oil mills or packaging centers) by anyone. The system (with dimensions 11 x 15 x 5 cm) can be powered by 3 AAA alkaline batteries or by a PC USB port. It is made of a PCB electronic board that integrates a microcontroller (STM32L152RCT6A) and all the electronics to perform the measurements. The sample is hosted in a modified 50 mL vial that features two cap-shaped stainless steel electrodes for the electrical conductance measurement.

The proposed instrument is potentially of great interest for small production centers that cannot afford an internal laboratory for quality analysis and send the samples to an external laboratory with high costs and time needed.

This work was developed in the context of the project OLEUM “Advanced solutions for assuring authenticity and quality of olive oil at global scale” funded by the European Commission within the Horizon 2020 Programme (GA no. 635690).

This is the peer reviewed version of the following article:

Marco Grossi, Enrico Valli, Alessandra Bendini, Tullia Gallina Toschi, Bruno Riccò

In-the-field determination of free acidity in olive oil using a portable battery-operated sensor system

JOURNAL OF THE AMERICAN OIL CHEMISTS SOCIETY, vol. 98, pp. 20-20 2021.

which has been published in final form at <http://dx.doi.org/10.1002%2Faocs.12529>

This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Use of Self-Archived Versions.

